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| 10/613,477 | 07/02/2003 | Robert W. Boesel | 029573-0501 | 9531 |

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| EXAMINER | |
|---|---|
| MALEK, LEILA | |
| ART UNIT | PAPER NUMBER |
| 2611 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/613,477 | BOESEL ET AL. | |
| | Examiner | Art Unit | |
| | Leila Malek | 2611 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *05 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *5* is/are allowed.

6)☒ Claim(s) *1-4 and 6-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/15/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Information Disclosure Statement*

1. The information disclosure statement submitted on 05/15/2007 has been considered and made of record by the examiner.

### *Response to Arguments*

2. Applicant's arguments filed on 04/05/2007 have been fully considered but they are not persuasive.

**Applicant's Argument:** Applicant argues, on page 8, lines 3-8, that since the portion of Guinon cited by the Examiner is in the background of invention, therefore Guinon teaches away from the combination cited in claim 1.

**Examiner's Response:** Examiner asserts that although Guinon discloses a different method to decrease the signal acquisition time in the invention disclosure, the method described in the background of invention is still valid for decreasing signal acquisition time in fixed weighting systems. Therefore, Guinon does not teach away from the combination cited in claim 1.

**Applicant's Argument:** Applicant argues, on page 9, lines 3-14, that there is no teaching or suggestion by Wang for providing samples to the searcher when not needed by the demodulator.

**Examiner's Response:** Examiner asserts that Wang shows (see Fig. 4) that a portion of the incoming data stream goes to the demodulator and the other portion goes to the searcher. The second portion has been interpreted as the portion not needed by the demodulator.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1,4, and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cai et al. (hereafter, referred as Cai) (US 5,164,959) in view of Guinon et al. (hereafter, referred as Guinon) (US 4,550,414).

As to claim 1, Cai teaches an equalization method that includes combining a plurality of channel measurements in a summer (Fig. 6, block 33), coupling the output of the combining step back into a loop feeding the input of the combining step, and acquiring a signal symbol based on the results of the combining step (Fig. 6; Col. 4, lines 22-31; Col. 5, lines 54-64). However, Cai doesn't teach that the symbol acquisition is done without exhausting every timing hypothesis through correlation operation. Guinon teaches that, depending upon channel conditions and signal phase probabilities, the range of a correlation detector can be narrowed so that not all timing hypotheses are addressed through its function (Col. 2, line 63 - Col. 3, line 11). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to employ the correlation range limiting technique discussed in Guinon with the detection loop taught by Cai. Doing so would decrease the number of correlations being done by the system for each symbol, thereby decreasing the signal acquisition time of the system (Guinon, Col. 2, lines 63-67).

As to claim 4, Cai teaches multiplying a received signal (Fig. 6, reference 41) by a channel reliability factor (Fig. 6, reference 42) in order to provide the product as a channel measurement to the summer (Fig. 6, reference 44).

As to claim 6, Cai doesn't teach that the channel measurement iterations are 1 chip apart. Guinon teaches PN code auto-correlation that is also done for every chip of the code. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to make channel measurements for each received signal chip. Doing so would accurately track channel changes with the smallest granularity possible in the system.

As to claim 7, Cai teaches that a threshold is applied to the channel measurements in order to acquire a signal symbol (Fig. 5b; Col. 5, lines 6-18).

As to claim 8, Cai teaches the use of a predetermined threshold, as described above, except for making it programmable. It would have been obvious to one having ordinary skill in the art at the time of invention to make the threshold programmable, since it has been held that the provision of adjustability, where needed, involves only routine skill in the art. In re Stevens, 101 USPQ 284 (CCPA • 1954).

4. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cai and Guinon, further in view of Loeliger et al., "Probability Propagation and Decoding in Analog VLSI," IEEE Trans. on Information Theory, Vol. 47, No. 2, pgs. 837-843, Feb. 2001.

As to claim 2, neither Cai nor Guinon teach the claimed combining equation. However, the specification of the instant invention identifies the combining operation as

the soft XOR operation (Pgs. 6 and 7, ¶0089). Loeliger teaches the same soft XOR equation in a different form, using the hyperbolic tangent function (Pg. 838, Section II, Eqn. (3)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the soft XOR method of combination in the design taught by Cai and Guinon to simplify the circuit and make it more robust (see page 838, left column). The transistor-level design for the soft XOR is well known (Loeliger, Fig. 1) and would be easy to implement in an integrated circuit.

As to claim 3, Cai teaches a feedback loop in which the output of the summer is coupled back into the input of the summer through a phase demodulator, multiplier, channel estimator, and another multiplier (Fig. 6). Therefore, the output of the combining operation eventually becomes the input to the combining operation.

5. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bond (US 4,347,580), further in view of Guinon.

Bond teaches an array correlator that performs correlations by separating digital samples into a plurality of groups in order to be stored in two shift registers, performing partial sums on the plurality of groups, and combining the results of the partial sums to obtain a correlation (Fig. 3, references 42, 44, 48, and 54; Col. 4, lines 52-62; Col. 6, lines 33-57; Col. 7, lines 19-38). Bond doesn't teach that performing partial sums includes rotating and combining all combinations of the samples. Guinon teaches that in order to find the properly aligned PN sequence, correlations must be performed for all possible phase shifts (Col. 2, lines 25-45). Therefore, it would have been obvious to one of ordinary skill in the art to combine every possible phase variation when calculating

the partial sums, which are part of the correlation operation. Doing so would ensure that the correct PN sequence phase is found. Bond and Guinon disclose all the subject matters claimed in claim 11, except that the total number of possible phases is 4 and the number of possible combinations is 16. However, it is a matter of design choice to have 4 possible phases and 16 possible combinations to meet the system requirements. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use alternative designs that were known to one of ordinary skill in the art.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bond and Guinon, further in view of Terasawa el al. (hereafter, referred as Terasawa) (US 2003/0147365).

Bond doesn't teach that addition included in the correlation operation was a coherent combining. Terasawa teaches a searching system that includes coherent combination upon correlation (Fig. 4, references 420 and 440; Fig. 9; Pg. 6, ¶0065). Therefore, it would have been obvious to one of ordinary skill in the art to use coherent combination in order to accumulate the correlations. Doing so would allow for the generation of an accumulated result from which the correct PN phase can be found.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Application Publication Wang (US 2002/0094017) in view of Bond.

Wang teaches a searcher method that separates incoming samples into an even and odd phase group, provides the samples to a demodulator, as needed, and provides the samples to a searcher (Fig. 4; Pg. 2, ¶0017; Pg. 3, ¶0026 and 0028). Wang shows

(see Fig. 4) that a portion of the incoming data stream goes to the demodulator and the other portion goes to the searcher. The second portion has been interpreted as the portion not needed by the demodulator. Wang doesn't teach storing the samples in sample buffers. Bond teaches the use of buffers to store samples (Fig. 3, references 42 and 44). Therefore, it would have been obvious to one of ordinary skill in the art to store samples in buffers in order to provide cheap and efficient access to received samples for processing modules.

8. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Bond, further in view of Easton et al. (hereafter, referred as Easton) (US 6,985,516).

As to claim 14, Wang and Bond disclose all the subject matters claimed in claim 13, except for entering a power down state upon providing a sufficient number of digital samples to the searcher. Easton discloses entering a power down state upon providing a sufficient number of digital samples to the searcher (see col.1, lines 35-52; col.8, lines 41-52; and col.13). It would have been obvious to one of ordinary skill in the art to include a power up/down circuit in the system taught by Wang and Bond in order to save power during times of inactivity.

As to claim 15, Easton further discloses a power control operable to power-down circuitry after the processing of all desired multi-path components and to power-up when the next buffer of sample data is ready to be processed (column 13, lines 45-59). It would have been obvious to one of ordinary skill in the art to include a power up/down

circuit in the system taught by Wang and Bond in order to save power during times of inactivity.

***Allowable Subject Matter***

9. Claim 5 is allowed. The following is a statement of reasons for the indication of allowable subject matter: a comprehensive search of prior art of record (for instance see the references cited below) failed to disclose, either alone or in combination, a method of searching digital communication signals, wherein the method comprising: combining a plurality of channel measurements; providing output of the combining of channel measurements as an added input to the combining a plurality of channel measurements; acquiring a signal symbol based on results from the combining of channel measurements without addressing every timing hypothesis individually via a correlation operation; and multiplying a received chip by a channel reliability; factor and providing the product as a channel measurement, wherein the channel reliability factor is determined using: $R = 4(\frac{Ec}{No})[\frac{1}{\sqrt{Ec}}]$

where R is the channel reliability factor Ec is a signal level and No is a noise level.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leila Malek whose telephone number is 571-272-8731. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Leila Malek
Examiner
Art Unit 2611

L.M.

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER